Doctor of Philosophy
Interim Examiner Report

Name and Institution of Examiner:	Dr Amiya Kuman Tripathy, Don Bosco Institute of Technology, India
Name of Candidate:	Kulsoom BUGHIO 10485075
Title of Thesis/Exegesis:	IoMT Security: A Semantic Framework for Vulnerability Detection in Remote Patient Monitoring

INTERIM REPORT SECTION 1: RECOMMENDATION AND REPORT OF EXAMINATION - WILL BE SHARED WITH THE CANDIDATE, SUPERVISORS, EXAMINERS AND PANEL CHAIR PRIOR TO ORAL EXAMINATION.

Please identify the number of theses marked previously at this level:

Report of Examination

Summarise for the candidate the quality of the work submitted which will also be used in the panel chair report (following oral examination). It would be useful to consider the criteria listed on the following page.

The overall appearance of the thesis is in general appropriate. The methods used in the thesis are, in general, adequate and justified. Taking the thesis as a whole, the author demonstrated sufficiently the ability to choose justified methods for reaching the research goals and to apply them.

The thesis is written well, with occasional minor grammatical and spelling mistakes. These are, however, minor issues that can be easily corrected. Despite certain errors, I commend the author's efforts and well-identified engagement and consider the submitted thesis as a piece of academic work that meets the general requirements for this type of academic work.

The contribution made by Kulsoom BUGHIO will be of immense use. Looking at the work and six research publications, it is clear that the candidate has done good work. I recommend without hesitation that the PhD thesis of Kulsoom BUGHIO entitled "IoMT Security: A Semantic Framework for Vulnerability Detection in Remote Patient Monitoring" be accepted in its present form for the award of a PhD degree.

Comments to look into:

Ontology has been implemented in OWL; why not try using Shapes Constraint Language (SHACL)?

Page 118: APIs can be vulnerable to a wide range of security risks, which can lead to data breaches, unauthorized access, and other forms of abuse, then how your model is addressing these vulnerability?

Page. 128: Countermeasures in cybersecurity addressed but and what about mitigation? This two goes hand in hand.

Page: 133: Which LLMs (Generative AI) models used?

Page: 140: How the Rule Engine or Inference System be evaluated, means the correctness?

Page 173: Accuracy ≈ 0.833 is this sufficient? Even though a better F1 score ≈ 0.889 is obtained.

Apart from SWRL other stuffs like Declarative Logic Programs (SWSL Rule) and First Order Classical Logic (SWSL-FOL), etc. are there then why SWRL?

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Name and Institution of Examiner:	Dr Bharanidharan Shanmugam, Charles Darwin University
Name of Candidate:	Kulsoom BUGHIO 10485075
Title of Thesis/Exegesis:	IoMT Security: A Semantic Framework for Vulnerability Detection in Remote Patient Monitoring

INTERIM REPORT SECTION 1: RECOMMENDATION AND REPORT OF EXAMINATION - WILL BE SHARED WITH THE CANDIDATE, SUPERVISORS, EXAMINERS AND PANEL CHAIR PRIOR TO ORAL EXAMINATION.

Please identify the number of theses marked previously at this level: 16

Report of Examination

Summarise for the candidate the quality of the work submitted which will also be used in the panel chair report (following oral examination). It would be useful to consider the criteria listed on the following page.

Hearty congratulations to the student and her supervisor for producing a thesis of this good quality. IoMT is critical in this digital age especially in Australia as the medical industry is facing mounting challenges with remote patient monitoring. The thesis proposed a novel sematic framework for vulnerability detection in RPM settings with a wider scop e of interoperability, heterogeneity and integration challenges. It is quite interesting to see that the proposed work has been tested with Generative AI and was able to achieve outstanding results.

I am amazed with the level of details the author had provided in most aspects of the thesis and the summary as follows :

Introduction has been clearly articulated with the introduction of research questions mapping it with the aims and objectives of the study which helps the readers to understand the flow of the thesis.

Literature review: The literature review covers all relevant literature related to IoMT and provides a comprehensive view of IoMT and its related areas. Clear boundaries and scope have been established, indicating what sources have been included and excluded. The literature review is well-organised, with a clear structure that allows readers to navigate it efficiently. The researcher had correctly identified the lack of dataset availability for IoMT.

Research Design : Solution methodology phase has been clearly articulated showing the solution methodology phases mapping it correctly with literature review and the results and discussions.

Results and discussion : The novel ontology for IoMT has been derived and validated through a case study. The whole chapter looks impressive with a smooth flow including Data Acquisition, Competency questions, reusing the ontology and conceptualisation. This is a good example of how a research thesis can be reproduced. Another interesting fact is the researcher proposed to partially automate the security posture of the network.

The research worked on a solution for heterogenous devices which is deep challenge in the medical devices due to its wider use and non-regulated like other networking devices.

I am confident that the work is of good quality and had made valuable contributions to the existing knowledge in IoMT. I congratulate the research to publish the chapters in Q1 journals which shows the exceptional work by the researcher and the supervisor.